

REMARKS/ARGUMENTS

Favorable reconsideration of this application in view of the following discussion is respectfully requested.

Claims 1 and 3-5 are pending in the present application. In the outstanding Office Action, Claims 1 and 3-5 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 6,183,627 to Friday in view of U.S. Patent No. 5,944,961 to Gandman.

The applied art does not teach or suggest a step of thermally cracking in a thermal cracking section, the heavy oil content obtained directly from a bottom of the distilling section so that a lightened thermally cracked product and residues of pitch or coke are produced, and a step of removing the residues of pitch or coke from the thermally cracking section, as recited in Claim 1.

Applicant respectfully submits that the thermal cracking of Friday is mild thermal cracking and that the thermal cracking of Applicant's invention is severe thermal cracking. Applicant respectfully submits that this argument is relating to a basic and common understanding with respect to other arguments and therefore discussed below are technological basics as a background of one or more examples of the present invention.

In particular, vacuum residue of crude oil contains originally asphaltenes more or less. Thermal cracking of such a vacuum residue produces light materials and asphaltenes. However, even for deasphalted oil (DAO), the thermal cracking also produces asphaltenes, while Friday represents the same understanding in line 13-20 of Column 4, by "which fraction may contain asphaltenes created as a by-product of the thermal cracker for further cracking." Of course, an amount of asphaltenes created in the thermal cracking is affected by the asphaltene content in the feedstock. However, since even DAO has a maximum conversion limit in general, the maximum conversion attainable is determined rather by whether asphaltene precipitates in oil containing cracked light materials. Therefore, a

solubility of asphaltenes in oil shall be discussed as a key factor to determine the maximum conversion attainable.

In the course of increasing a cracking degree of residue and DAO, the oil characteristics is changing to be lighter and then solubility of asphaltene to oil is degraded. The attached Figure shows asphaltenes content contained in vacuum residue from a lot of crude oils against specific gravity of vacuum residue. This correlation suggests that lighter or more paraffinic oil, which indicates low gravity, can hardly dissolve or suspend asphaltene in oil, because a solubility of the asphaltene to oils decreases. Therefore, even if thermally cracking the DAO, it is impossible to maximize severity of thermal cracking during producing lighter fractions in oil. Professionals, who are familiar with the residue cracking technology may understand that a maximum conversion attainable on a thermal cracking caused in oil liquid solution is limited to less than about 30 to 35%, and therefore Friday is defined as a mild thermal cracking. As shown in Figures 5 and 6 of "Potential for Asphaltenic Bottom Cracking Technology in Upgrading Ultra-Heavy Oil" attached in the Appendix, it is clear that asphaltene content increases in Visbreaking and Hydro-visbreaking (similar to thermal cracking with injecting hydrogen donor) and these processes have own maximum conversion attainable. It is confirmed that the maximum conversion is 30% for Visbreaking and 35% for Hydro-visbreaking.

On the other hand, one of methods to maximize residue conversion is actually realized as following steps: 1) when a cracking creates lighter fraction, this method is to immediately vaporize the cracked light material from the oil; 2) as the result, the liquid remained becomes heavier such as with high gravity and has high solubility of asphaltene to oil. Actually the liquid becomes heavy residue; and 3) coke deposition can be completely avoided in liquid of thermal cracked residue, which contains mainly asphaltenes.

This is a unique reaction model applied in Eureka process, which one or more examples of the present invention recommends as a process component. In this method, a liquid of the thermal cracked residue does not contain gas oil, rather mainly contains asphaltenes. Claim 4 in the present invention recites these features. As such, the claimed invention is different from mild thermal cracking such as that set forth in Friday. The other method is not to produce a liquid, but coke and cracked vapor without any liquid. The method is a category of coking process, such as Delayed coker, Fluidcoker and Flexicoker. The vapor is condensed and recovered in the following fractionation as product oils and off gas.

The above mechanism claimed in the present invention is different from Friday which avoids precipitation of asphaltene in cracked oil liquid during thermal cracking. Please see at least line 42-48 of Col-3 in Friday. Friday maximizes a cracking in oil liquid, which is different from one or more examples of the present invention.

Applicant submits that the removal of the solvent deasphalting in Friday would be impracticable because the thermal cracking section would shut down due to coke deposition over time. In this regard, it is a feature of Friday to produce oil liquid from the thermal cracking which contains light materials, which is returned to fractionation section. Therefore, the thermal cracking section of Friday has no operation of withdrawing thermal cracked residue containing mainly asphaltene. The thermally cracked residue is separated in SDA after fractionation. If the SDA would be removed from the Friday, the system has no outlet of thermal cracked residue, which is accumulated in the process. And the process is occupied by coke and naturally shut down over time.

Gandman discusses a technology which is applied in thermal cracking of distillates such as ethane, propane, butane, naphtha, gas oil such as to produce ethylene. The feedstock in Gandman has no residue component and produces less asphaltene due to gas oil, not the

DAO and Vacuum residue which contains a lot of large molecules besides asphaltenes. Therefore, the coke deposition in a field of this application occurs at a local part in a process, which is depressed with Gandman. On the contrary, a key issue in residue thermal cracking is how to avoid not a local coking but coke deposition in a whole system after thermal cracking. Therefore, Gandman is a completely different technology field from residue thermal cracking such as in the present invention and Friday. Accordingly, it is respectfully submitted that there is no basis in the teachings of either Friday or Gandman to support their applied combination. Certainly, the outstanding Office Action fails to cite to any specific teachings within either reference to support the applied combination. Accordingly, it is respectfully submitted that the combination of Friday with Gandman is the result of hindsight reconstruction in view of the teachings of the present specification, and is improper.

Applicant respectfully submits that 100% conversion cannot be obtained by the mild thermal cracking in Friday. Friday discloses that the thermal cracking be performed under severe conditions, thereby maximizing the generation of distillate products. The maximizing of distillate generation under severe conditions would lead to a 100% conversion. Since Friday cannot maximize the conversion due to keeping oil liquid containing light materials in the process, 100% conversion cannot be obtained, as discussed previously.

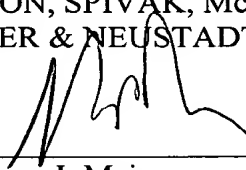
Accordingly, Applicants respectfully request the withdrawal of the rejection of the claims under 35 U.S.C § 103(a).

Consequently, for the reasons discussed in detail above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

Respectfully submitted,

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